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Mass transfer kinetics during osmotic dehydration of banana in different osmotic agent

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■ **ABSTRACT :** In this study, osmotic dehydration of banana was carried out on the basis of the mass transfer kinetics. During osmotic dehydration of banana, three concentration levels (40, 50 and 60 %) of osmotic agents such as sucrose, fructose and maltodextrin were used at three different levels of osmotic solution temperature (40, 50 and 60 °C). The samples to solution ratio were taken at three levels *i.e*., 1:4, 1:5 and 1:6 for all the experiments. Full factorial design was employed to determine the number of experiments for osmotic dehydration of banana. Osmotic solutions were prepared by dissolving different levels of sucrose, fructose and maltodextrin in distilled water (w/w). A magnetic stirrer was used to dissolve the content. Fresh osmotic solution was prepared for every run. The surface moisture was removed by using blotting paper. Osmotic dehydration was carried out from 10 to 240 min with varying time intervals to investigate the osmotic kinetics at each experimental condition. All the experiments were replicated thrice. The initial moisture content of banana samples and moisture content of osmosed samples (10, 20, 30, 40, 50, 60, 90, 120, 150, 180, 210 and 240 min) were determined by hot air oven method. The moisture loss and solid gain were computed on the basis of mass balance. The effect of osmotic agents, concentration of osmotic solution, temperature of osmosis, sample to solution ratio and osmotic time on moisture loss and solid gain during osmotic dehydration of banana were studied. Determination of the moisture and solid change in banana samples during osmotic dehydration under different treatments is a function of drying time. In each case, the best fit was selected and the kinetic rate constant and other statistical parameters at each process were determined. The moisture loss and solid gain increased with increasing the sucrose solution concentration at constant sample to solution ratio and temperature of solution. The moisture loss was found to be higher for samples osmosed in maltodextin compared to those osmosed in sucrose and lower than the sample osmosed in fructose at the same concentration, temperature of solution and sample to solution ratio. The solid gain was higher for samples osmosed in fructose compared to those osmosed in maltodextrin and sucrose at the same concentration and temperature of solution with the same sample to solution ratio, because solid uptake is inversely correlated with the molecular size of the osmotic agents. Zero-order and first-order kinetic models were used for the mass transfer kinetics during osmotic dehydration of banana samples in sucrose, fructose and maltodextrin solution. The mass transfer kinetic studies reveal that the data for moisture loss and solid gain were accurately fitted by zero-order kinetic model compared to a first-order kinetic model with high values for the corresponding co-efficients of determination (R^2) and low value of root mean square error (RSME).

■ **KEY WORDS :** Banana, Osmotic dehydration, Osmotic agent

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